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Empirical Estimates of Amenity Forest Values: A Comparative Review

Cindy F. Sorg and John B. Loomis

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Empirical Estimates of Amenity Forest Values: A Comparative Review[1]

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ABSTRACT

Comparisons of empirical estimates of the values of wildlife, wilderness, and general recreation require that the values are based on comparable methodologies and comparable units of measurements. Adjustments necessary to allow such comparisons are outlined and are applied to an extensive data base of valuation studies.

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[1] *Headquarters is in Fort Collins, in cooperation with Colorado State University.*

Empirical Estimates of Amenity Forest Values: A Comparative Review

Cindy Sorg and John Loomis

INTRODUCTION

The focus of land management planning is changing, broadening from primarily a biological/ecological orientation to include economic efficiency considerations as an important component.

Recent emphasis at the federal level is to examine resource uses for economic utility. This report is designed to help land and natural resource management planners interpret wildlife, wilderness, and general recreation values derived using economic methodologies. After a brief discussion of methods used to derive these values, this report evaluates and summarizes the net values of wildlife, wilderness, and general recreation found in empirical studies since the mid-1960's, to allow comparison of values reported using different methodologies and different units of measurement. These values have been put on the same basis by adjusting for the effect of inflation on dollar values of earlier studies and by standardizing the methodology of all applications. The values also are now on an activity day basis, which is the amount of time in a day devoted to the primary activity. This standardization permits distinguishing differences in values resulting from resource quality-location from differences resulting from methodology.

METHODOLOGY

The data for this review came from published and unpublished information on recreation economics.

The studies relied on estimates of the net value (value in excess of actual expenditures) using primarily the Contingent Value Method (CVM) and Travel Cost Method (TCM). However, one study used the Household Production or "Hedonic Method" (Bell 1981), and one study used a "Hedonic-Travel Cost Method Synthesis" (Brown and Plummer 1979). Both of these approaches are new and promising valuation methodologies.

Because most of the empirical studies estimated the net value of a certain recreation activity at a specific site, given or adjusting for the availability of existing or substitute sites, the values reported represent marginal values for an additional recreation site, herd unit, stream, or wilderness area. The value represents net willingness to pay (i.e., average consumer surplus) for recreation. This is the appropriate value for efficiency analysis. The use of average consumer surplus is the appropriate measure when access to the site is not rationed by price but instead by user choice (Mumy and Hanke 1975, Loomis 1982a).

Advances in the theoretical foundation and empirical applications have provided the basis for a general nonmarket valuation framework within the context of microeconomic theory that provides "rules" for generating comparability between various applications of TCM and CVM (Bocksteal and McConnell 1981, Brown et al. 1983).

Surveys of the literature are not substitutes for region-specific estimates of the value of recreation. These can be done using campground fee receipts, wilderness permits, and state game information as data sources for TCM. A few National Forests are already conducting TCM studies. A systematic effort to harness the existing data and skills within each Forest would provide more region-specific values for national forest plans.

In the preparation of this report, some empirical studies were rejected, because their results, in concept or in format were not relevant (e.g., dollar values on an annual basis). An initial set of adjustment criteria and size of each adjustment were formulated. Initial dollar values were calculated based on these adjustments. Then the adjustment criteria, size of adjustment, and values were submitted to a panel for review. The panel included William Brown, Oregon State University; David King, University of Arizona; Richard Walsh, Colorado State University; Elizabeth Wilman, Resources for the Future; and Dennis Schweitzer, Gary Elsner and Don Rosenthal, USDA Forest Service. Each member reviewed the adjustments and responded with comments. Considering their comments, the size of the adjustments were modified and the dollar values recalculated based on the new adjustment guidance. A discussion of the adjustment criteria and the size of the adjustment recommended by the panel follows.

Inappropriateness of Gross Expenditures

This method has been used extensively. The value of a recreation experience is alleged to equal the total amount of money spent by recreationists while participating in the activity. While insight into local income effects is provided, gross expenditures do not give an estimate of additional value created by an increase in recreation opportunities. Management decisions should be based on this net value in excess of the costs of taking advantage of the recreation opportunity, because this measures the real monetary value that would be lost if the opportunity were not available. What is needed is not a gross value but the net contribution to recrea-

tionists added by the recreation opportunity. Gross expenditures, while important locally, merely reflect transfers of expenditures from one area of the economy to another and are not net benefits. For example, in determining whether it is economically feasible to do some site improvement, such as planting trees in a picnic area, the management costs of planting must be compared to the benefits. Gross expenditures do not provide information on net benefits.

Travel Cost Method

This approach, first introduced by Hotelling (1949), was later used by Clawson (1959) to empirically estimate recreation benefits. The method is based on the premise that travel cost can be used as a proxy for price in derivation of a recreational site demand curve. The first step of a zonal TCM model involves dividing the area around the site into counties of origin. Using this origin data, a visitation rate (visits per capita) from each origin is calculated. Utilizing this visitation rate in conjunction with socioeconomic information for each origin, a first stage site demand curve can be estimated using regression analysis. Regression analysis involves relating visits per capita as a function of trip cost or distance, substitute sites, quality indexes, and various socioeconomic data. The second stage demand curve is derived by successively adding alternative hypothetical fees to each origin's travel cost, then estimating visits from each origin at each fee using the per capita demand curve. At a zero fee, net benefits is the total area under the demand curve (Johnson et al. 1981).

Contingent Valuation Method

This method is based on the notion of a bid curve (Bradford 1970). It involves directly asking individuals to give a measure of their consumer surplus by determining how much more a recreationist would be willing to pay for the recreation opportunity before going without the opportunity. Comprehensive reviews of this method are provided by Brookshire et al. (1980), and Schulze et al. (1981).

EVALUATION CRITERIA AND ADJUSTMENTS NECESSARY FOR COMPARABILITY OF VALUES

While nearly all of the studies reviewed are Travel Cost Method (TCM) or Contingent Value Method (CVM) studies (except as noted), some were performed before certain refinements in the methodology were developed, and others represented applications designed to highlight some aspect of resource valuation. Therefore, standardization of the resulting dollar values was necessary to allow the earlier, more developmental applications to be comparable to more recent applications. In addition, adjustment was necessary to bring 1965 or 1970 dollar values to 1982 dollar values.

The following types of adjustments are supported by the economic literature and were reviewed and approved by the panel.

1. For studies which did not report dollar values per day (e.g., per trip), put them on a per day basis.
2. Adjust dollar values to the January 1982 base year, using the GNP price deflator.
3. Adjust for omission of travel time in estimating TCM demand curve.
4. Adjust values derived by "individual observation" TCM for those activities where probability of participation is expected to vary significantly with travel cost.
5. Adjust values for restriction of TCM sample to in-state residents.
6. Adjust for omission of protest mechanism in CVM studies.
7. Report adjusted values by study location.

Most studies required only one or two types of adjustment.

Adjustment to Activity Day

Many studies reported values per "visitor day," "activity day," or "activity occasion." However, for the few studies that reported values per trip, conversion to an activity day was necessary. An activity day is that portion of the day devoted to the primary trip activity (i.e., picnicking activity day would possibly last four hours). If the studies reported a trip averaged 1.5 days, the value per trip was divided by 1.5 Because 1.5 days means that, on the average, 50% of the people spent 1 day, and 50% spent 2 days, this calculation produces a reasonable conversion from trips to days. Data on days per trip were derived from the studies themselves, by calling the study author(s), or by calling the appropriate State Fish and Game Department for an average length of hunting or fishing activities. Some studies reported recreation site value for the activity. This was divided by number of visitor days or trips to get value for the respective unit.

Updating Study Values to 1982

The nominal value of any consumer good or service, including recreation services provided by a Forest Service site, is expected to rise with the rise in the general price level. Therefore, to make the nominal values of studies performed at different dates useful for decision-making, all nominal values of recreation were adjusted to a common base year, January 1982, using the GNP implicit price deflator.

Adjustment for Travel Time

As early as 1965, researchers (Cesario and Knetsch 1970) became aware that omission of travel time from the travel cost model would lead to a substantial downward bias in the estimated benefits derived under the Travel Cost Method.

Time spent travelling can be viewed as the opportunity cost of not using the time in another activity. Consider a demand curve that reflects statistical estimation based on out-of-pocket travel costs only. If the cost to recreationists in County A was raised from $5 to $10 per trip, they would reduce visitations to the quantity taken by recreationists in County B. However, recreationists in County B incurred a price of $10 Travel Cost and 1-hour travel time. Recreationists in County A, with the addition of $5 to the original $5, incur a travel cost of $10, but still incur only their original travel time of 1/2 hour. Thus, the new price paid by recreationists in County A is still less than County B. Therefore, recreationists in County A would be expected to consume more visits at $10 travel cost than recreationists in County B. This "time corrected" demand curve is outside the travel cost only demand curve. The value of recreation (measured as the area above the travel cost, but below the demand curve) is larger for the "time corrected" demand curve.

Because it is generally recognized that, for most recreation activities, the travel time price is just as important as the travel cost (Cesario and Knetsch 1970; Brown et al. 1973, Wilman 1980, McConnell and Strand 1981) much effort has gone into alternative ways of adjusting for travel time. The most direct method is to disaggregate the data into its original "individual observations" and then specify a separate independent variable. This was demonstrated by Brown et al. (1973) and has since been adopted by many other researchers (Martin et al. 1974, Ward 1982).

Another method has been to actually place a dollar value on time and add it to the travel costs (Cesario 1976). The value of travel time from commuting studies was estimated to be between one-fourth and one-half the wage rate (Cesario 1976). McConnell and Strand (1981), in a sport fishing application, found a value of 60% the wage rate. Bishop and Heberlein (1979) found that, when travel time was valued at one-half the hourly income rate, the TCM derived values began to come closer to the actual cash value of the goose hunting permit. Ward (1982) used a technique similar to that of McConnell and Strand (1981) to derive a value of travel time in southeastern New Mexico. He arrived at an average value of travel time of $7.10 per hour.

Ward's work provides a starting point to begin actual adjustments for studies that omitted travel time. His work, along with that of Bishop and Heberlein (1979), showed that the magnitude of the benefit estimates vary with the change in value of travel time. Bishop and Heberlein (1979) found a 150% increase in the value of goose hunting when travel time went from a zero value (i.e., travel time omitted) to one-quarter of the hourly income rate. This is much higher than has been found in other studies. For example, Ward (1982) found that benefits increased by 60% when the value of travel time was increased from zero to 40% of his derived value of travel time.

While there is near unanimity in the literature on the need to include travel time, the exact size of the correction of benefit estimates from studies which omitted travel time is not known with precision. For the purpose of this report, a conservative 30% upward adjustment was used as an average for all activities.

Adjustment for Use of Individual Observation Travel Cost Method

Pioneered by Brown et al. (1973), the use of individual observations instead of zone aggregates as the dependent variables has gained widespread acceptability. The individual observation method uses trips or visits per year to site x by a given household or person as the dependent variable. Zonal TCM uses visits per capita from a county or zone of origin. As Brown et al. (1983) concluded, while the individual observation TCM is econometrically more efficient, it omits the effect of travel costs on the probability of participation. That is, as travel costs to a site increase, both the number of trips taken by participants and the number of participants per capita changes. This is consistent with the way Cicchetti (1973) dichotomized recreation use estimation processes. However, the individual observation method omits the effect of higher travel costs on lower probability of participation and leads to a more inelastic (steeper) demand curve (Brown et al. 1983). This more inelastic demand curve tends to result in overstating the recreation benefits, if the probability of participation decreases significantly at higher travel costs.

Because it is unlikely that probability of participation increases with higher travel costs, some downward adjustment in net value of recreation estimated by individual observation is necessary. The exact size of the downward adjustment depends on the degree to which probability of participation decreases with travel cost.

Since this change in probability of participation as a function of travel cost is likely to vary by activity, the 30% across the board downward adjustment that was suggested originally probably was, on average, too great. Instead, a range of downward adjustment between 0% and 30% was used. For activities in which individuals have acquired specialized equipment and skill, the probability of participation was less likely to be influenced by travel costs, therefore, no downward adjustment was made. However, for activities where specialized skill and equipment was not involved, a downward adjustment was made. To more accurately adjust individual observations, information is needed on how the probability of visiting a particular site varies with travel costs. Unfortunately, this information is not readily available.

Adjustment in TCM Studies for Restriction to In-state Users

One of the assumptions of the Travel Cost Method (TCM) is that, at each travel cost, any user who wishes to visit the site is not excluded. If out-of-state users are excluded from the survey, the visitation rate is not correct. Omission of out-of-state users tend to result in an underestimation of visits at relatively high travel costs. The effect on the demand curve and benefit estimates is

This way, in actuality, we often using for recreation travel time. For many car travelers, travel may be part of the actual recreation with 0 or even negative cost (i.e. it is desirable time utilization).

similar to that of omission of travel time. That is, benefits will tend to be underestimated to the degree that out-of-state users travel further distances than in-state users. This underestimate is further aggravated when the highest observed travel cost is used as the upper limit in deriving the second stage demand curve. If out-of-state users travel further than resident users, this omission in the sample TCM will further reduce benefits estimates. The above discussion applies to single site and single purpose out-of-state users.

Omission of out-of-state users was believed to be likely to produce the most serious underestimate of benefits for activities such as big game hunting, waterfowl hunting, cold water fishing, anadromous fishing, and boating. Therefore, values for these activities which omitted out-of-state users were adjusted by 15%.

Omission of Protest Mechanism in Contingent Valuation Method Studies

The Contingent Value Method is also known as the "bidding game" or direct survey method. CVM solicits a marginal value for recreating at a specific site, given the availability of alternative sites and activities. While the method has been criticized by some, Schulze et al. (1981), and Brookshire et al. (1982) provided substantial empirical evidence that CVM provides values consistent with economic theory and other methods of nonmarket valuation.

In recent CVM applications, it has been customary to include what is known as a "protest mechanism" to check to see if some proportion of the zero bids are rejection of the bidding game method itself or in fact zero value beyond current expenditures for the good under study. For example, use of taxes, utility bills, or license fees may be viewed as an inequitable way of paying for the good, because nonresidents or nonhunters/fishermen would benefit from provision without paying any costs. With these types of payment devices in particular, some zero "bids" may reflect a protest against this payment mechanism. If no cross check is done to investigate why persons bid zero, all zero bids are attributed to the resource value. The U.S. Water Resources Council (1979) indicated that the protest zero bids should not be included in value estimates, because they do not reflect benefits.

Because acceptable CVM applications are supposed to have no more than 15% of such protest bids (U.S. Water Resources Council 1979), an upward adjustment of up to 15% for omission of a protest mechanism was used for sensitive payment devices. Such payment devices include utility bills, taxes, and license fees.

ANADROMOUS FISHING

Literature Reviewed

Several studies have estimated net economic values for salmon and steelhead sport fishing in Oregon and salmon sport fishing in Washington (table 1). Brown et

Table 1.—Anadromous fishing methodological adjustments

Author Study location Date of data	Reported value/ Activity day	Adjustment to 1982	Adjustment to include travel time	Adjustment for individual observation	Adjustment for in-state only	Adjusted values/ Activity day
Gordon (1970) Idaho 1968	17.00	41.70	54.21			54.21
Brown et al. (1980) Washington 1977	20.92	30.12			34.64	34.64
Brown et al. (1976) Oregon 1974	21.77	33.62			38.66	38.66
Brown et al. (1980) Oregon 1977	17.36	25.00			28.75	28.75
Matthews and Brown (1970) Washington 1967	38.75	99.02				99.02
Crutchfield and Schelle (1979) Washington 1978	18.00	25.92				25.92

al. (1976) reestimated data from an earlier study (Brown et al. 1964) of the zonal Travel Cost Method, using an adjustment for travel time. This also updated the base data from 1962 to 1974 dollars. Their estimate of $21.77 per day was an average for Oregon salmon-steelhead fishing.

Matthews and Brown (1970) used the Contingent Value Method to estimate the value of salmon sport-fishing in Washington. They expressly addressed availability of substitutes when asking their value questions. They found an average value of $38.75 in Washington.

A more recent zonal TCM application by Brown et al. (1980), yielded estimated values of $17.36 per 3.3-hour day for an average in Oregon. The state average for Washington was $20.92 per day, estimated using the zonal TCM. Both of these were based on a large mail survey of residents. The equations for Oregon considered the effect of travel time; but in Washington, only one of the three equations considered travel time.

A more recent CVM survey by Crutchfield and Schelle (1979) yielded a willingness to pay value of $18.00 per day for ocean sport fishing in Washington.

A state average value of sport salmon fishing in Idaho, estimated using the zonal TCM, was $17.00 a day (Gordon 1970). However, no adjustment was made for travel time.

Methodological Adjustments

Conversion of Values to 1982 Base Year

The updated Brown et al. (1976) values go from $21.77 to $33.62 (table 1). The updated Matthews and Brown (1970) value is $99.02 per day. The Brown et al. (1980) value for Oregon is updated to $25.00 and to $30.12 for Washington per day. The Crutchfield and Schelle (1979) updated value is $25.92 per day. Updating Gordons (1970) study using 1968 data to 1981, yielded a value of $41.70 per day.

Adjustment for Omission of Travel Time

Two of the three Brown et al. (1980) TCM equations for Washington did not adjust for travel time. Because these were developed for less important salmon areas, no adjustment was made to the values contributed by these two equations.

Gordon's (1970) study in Idaho did not consider travel time. The updated value must be adjusted upward by 30% to $54.21 per day (table 1).

Adjustment for Individual Observation TCM

Only the Brown et al. (1976) study utilized individual observation TCM. However, because the probability of participation in anadromous fishing probably did not have a strong inverse relationship to travel costs, no adjustment was made for this activity.

Adjustment for In-state Sample

For relatively unique activities, such as salmon fishing, the omission of out-of-state users was of particular concern. Thus, the values for Oregon and Washington need to be adjusted upward by 15%. Making this adjustment results in values of $28.75 and $34.64 for Oregon and Washington, respectively, for the Brown et al. (1980) values, and $38.66 for Brown et al. (1976) value (table 1).

BIG GAME HUNTING

Literature Reviewed

Miller (1980) derived values for deer hunting in Colorado using both individual observation TCM and noniterative, open-ended CVM. The study derived separate values for resident and nonresident rifle hunting, resident sportsman hunting, muzzle-loading rifle hunting, and archery hunting. The TCM and CVM values reported here are for resident rifle hunting. The sportsman license no longer exists. Muzzle-loading and archery licenses represent a very small portion of total hunting. No TCM values were derived for nonresidents, but resident rifle hunting values were reported. A mail questionnaire was sent in 1974 to a random sample of license holders. The TCM values were adjusted for travel time but not substitutes. The CVM values represent willingness to pay additional costs to get to the hunt area but not additional costs at the hunt site. Values derived are $9.11 and $65.23 for CVM and TCM, respectively.

The individual observation TCM was used by Martin et al. (1974) to derive hunting values in Arizona. They reported a value for deer hunting and a value for all other big game hunting. The study adjusted for travel time and substitute sites. Data were collected in 1970 for in-state users only. A deer hunting value of $52.85 was reported for a household trip. The average number of days per household trip was 1.9, resulting in a value of $27.82 per household. The average number of people hunting in a household was 1.5, resulting in a value of $18.54 per visitor day.

A value for all other big game hunting was reported as $57.43. The average number of days per household trip was 1.9, resulting in a value of $30.27 per household. The average number of people hunting in a household was 1.5, resulting in a value of $20.15 per visitor days.

Loomis (1982a) used zonal TCM to derive the value of antelope hunting in Utah. Data were collected in 1979, but only in-state users were sampled. The study adjusted for travel time but not for substitute sites. A value of $20.77 per trip was reported. Average trip length was 1.5 days, resulting in a value of $13.80 per visitor day. Loomis (1982a) suggested that this value may be an underestimate of the true value because a linear functional form was used.

Hansen (1977) utilized CVM to derive values for deer, antelope, and elk hunting in the Intermountain Region.

Data were taken from the 1975 U.S. Fish and Wildlife Service Hunting and Fishing Survey. The mail survey format was noniterative, open-ended. Respondents were asked how much more they would be willing to spend before not engaging in the particular hunting activity in question. The following user day values were derived. Deer hunting was valued at $20.55, antelope hunting at $11.70, and elk hunting at $22.63 per visitor day.

Deer hunting in Utah was valued by Wennergren et al. (1973) using zonal TCM. Data were collected in 1970 from an in-state sample. The study did not adjust for travel time or substitutes. The study reported a value of $18.67 per trip. Average trip length was 2 days, resulting in a value of $9.34 per visitor day.

Big game hunting in Idaho was valued by Brown and Plummer (1979) using a combination Hedonic-TCM. Data were collected in 1976. The study did not adjust for travel time or substitutes. An average state value of $32.73 per activity day was reported.

Brown et al. (1973) measured the value of big game (deer and elk) hunting in Oregon. The study utilized individual observation TCM in a study which adjusted for travel time but not substitute sites. Instate mail sampling was done in 1968 from a list of hunters supplied by the Oregon State Game Commission. A value of $9.20 per visitor day was reported.

The value of big game hunting in western Oregon was measured by Brown and Plummer (1979) by using the Hedonic-TCM. The study did not adjust for travel time or substitute sites. Based on data collected in 1976, a value of $38.14 per activity day was reported.

Bell (1981) used the Hedonic method to value big game hunting in south-central Louisiana along the Atchafalaya River Basin. Data were taken from the 1975 U.S. Fish and Wildlife Service Hunting and Fishing Survey and the Atchafalaya Basin users survey. Bell's study did not adjust for travel time or substitute sites. A value of $14.60 per visitor day is reported.

Utilizing individual observation TCM, Fisher (1982) measured the value of deer hunting in Pennsylvania. Data were collected in 1975. Fisher's study adjusted for travel time but not substitute sites. A value of $80.00 per visitor day was reported. At first glance this value seems extremely high, but for what it measures and where it measures it, the value is reasonable. At the time of the study, Pennsylvania had a higher annual harvest of deer than any other state.

A national average value for deer hunting was derived using CVM, based on data collected in the 1980 U.S. Fish and Wildlife Service Hunting and Fishing Survey. The iterative personal interview questionnaire asked respondents how much more they would be willing to pay via change in trip costs for the 1980 hunting season. A value of $24.00 per activity day was reported.

Methodological Adjustments

Conversion of Values to a 1982 Base Year

The values for all big game hunting studies were converted to 1982 values, and are shown in table 2.

Adjustment for Omission of Travel Time

The studies by Wennergren et al. (1973), Brown and Plummer (1979), and Bell (1981), all omitted travel time in calculating values. Therefore, the values reported in these studies were increased by 30% (table 2).

Adjustment for Individual Observation

No downward adjustments for individual observation TCM were made for big game, because the probability of participation in big game hunting probably does not have a strong inverse relationship to travel costs.

Adjustment for In-state Sample

Because big game hunting in a given state often draws hunters from neighboring states, a 15% upward adjustment was made for studies which were limited to an in-state sample.

The studies by Miller (1980), Martin et al. (1974), Loomis (1982a), Wennergren et al. (1973), and Brown et al. (1973) all were based on in-state samples only. Therefore, all values reported by these studies were adjusted upward by 15% (table 2).

CAMPING

Literature Reviewed

Walsh et al. (1980a) found a value of $13.72 for camping in underdeveloped sites near or adjacent to high mountain reservoirs in Colorado. They found an average value of $10.90 per day for camping at developed sites near or adjacent to high mountain reservoirs. Both of these studies used a noniterative, open-ended Contingent Value Method approach during on-site interviews. In a second Colorado study, Walsh and Olienyk (1981), using an on-site survey and an iterative Contingent Value Method, found the value per day of developed camping to be $5.59, and for semi-developed camping to be $7.99 per day.

Martin et al. (1974) estimated the value of general outdoor recreation in Arizona. In this category, the average stay for camping was 1.4 days. Using an individual observation Travel Cost Method, they found a value of $66.54 per household trip. Dividing by 1.4 days and 3.4 persons per household trip, the value per person per activity day was $14.00. Their study adjusted for travel time.

Ward's (1982) study on recreation in southeastern New Mexico included sites in which there is developed camping. Using the individual observation TCM, Ward found an average value of $11.39 per visitor day. His study also adjusted for the value of time.

Michaleson (1977) estimated the value of camping associated with river recreation in Idaho, using the individual observation TCM. He found an average value of $9.00 per day. In another study using an individual

Table 2.—Big game hunting methodological adjustments

Author Study location Date of data species	Reported value/ Activity day	Adjustment to 1982	Adjustment to include travel time	Adjustment for individual observation	Adjustment for in-state only	Adjusted values/ Activity day
Miller (1980) Colorado 1974 deer (TCM)	65.23	114.61			131.80	131.80
Miller (1980) Colorado 1974 deer (CVM)	9.11	16.00			18.40	18.40
Martin et al. (1974) Arizona 1970 deer	18.54	40.91			47.05	47.05
Martin et al. (1974) Arizona 1970 other	20.15	44.46			51.13	51.13
Loomis (1982a) Utah 1979 antelope	13.80	17.11			19.68	19.68
Hansen (1977) Intermountain 1975 deer	20.55	33.03				33.03
Hansen (1977) Intermountain 1975 antelope	11.70	18.81				18.81
Hansen (1977) Intermountain 1975 elk	22.63	36.37				36.37
Wennergren et al. (1973) Utah 1970 deer	9.34	20.61	26.79		30.81	30.81
Brown & Plummer (1979) Idaho 1976 all	32.73	50.02	65.00			65.00
Brown et al. (1973) Oregon 1968 all	9.20	22.49			25.86	25.86
Brown and Plummer (1979) Oregon 1976 all	38.14	58.29	75.78			75.78
Bell (1981) Louisiana 1975 all	14.60	23.47	30.51			30.51
Fisher (1982) Pennsylvania 1975 deer	80.00	128.59				128.59
USFWS (1980) U.S. 1980 deer	24.00	27.32				27.32

observation Travel Cost Method, Michaleson and Gilmour (1978) found a value of $3.73 per visitor day for outdoor recreation. Camping was the predominant activity (77% of respondents). They also adjusted for travel time. The data were collected in 1971 from on-site interviews.

Sutherland (1980) found an average value of $4.23 per visitor day for camping in Oregon and Washington. This was estimated using a zonal TCM. He did not adjust for travel time, however, the study adjusted for substitutes. Brown and Plummer (1979) estimated the value of camping in western Washington at $5.83 per day using a Hedonic TCM. They did not adjust for travel time. The data reflect on-site registration.

Gibbs (1974) used an unusual variant of the individual observation TCM to estimate the value of camping associated with river and lake recreation in Florida. his approach was to look at variations in on-site time as a function of cost per day. His value per trip was $21.62. The average length of trip was about 2 days. Thus, an average value was $10.81 per visitor day. The study did not adjust for travel time.

Kalter and Gosse (1969) estimated the value of camping in New York using a zonal TCM. The estimated value of $6.50 is a statewide average. Their study did not adjust for travel time, however.

Methodological Adjustments

Conversion of Values to 1982 Base Year

The values reported for all camping studies were converted to 1982 values, and are shown in table 3.

Adjustment for Omission of Travel Time

The TCM by Sutherland (1980), Brown and Plummer (1979), Gibbs (1974), and Kalter and Gosse (1969) all

Table 3.—Camping methodological adjustments

Author Study location Date of data	Reported value/ Activity day	Adjustment to 1982	Adjustment to include travel time	Adjustment for individual observation	Adjustment for in-state only	Adjusted values/ Activity day
Walsh & Olienyk (1981) Colorado 1980	5.59-7.99	5.80-8.30				5.80-8.30
Walsh et al. (1980a) Colorado 1980	10.90-13.72	12.41-15.64				12.41-15.64
Martin et al. (1974) Arizona 1970	14.00	30.80		26.18		26.18
Ward (1982) New Mexico 1978	11.39	15.32		13.00	15.00	15.00
Michaleson (1977) Idaho 1971	9.00	18.93		16.00		16.00
Michaleson & Gilmour (1978) Idaho 1971	3.73	7.91		6.70		6.70
Sutherland (1980) Washington & Oregon 1980	4.23	4.81	6.25			6.25
Brown & Plummer (1979) Washington 1976	5.83	8.75	11.40			11.40
Gibbs (1974) Florida 1970	10.81	23.78	31.00	26.35		26.35
Kalter & Gosse (1969) New York 1965	6.50	14.30	18.60			18.60

omitted travel time. Therefore, the values reported for each of these studies were increased by 30% (table 3).

Adjustment for Individual Observation TCM

As discussed previously, values derived from individual observation TCM were adjusted downward slightly to make them consistent with values derived from zonal TCM (table 3).

Adjustment for In-state Sample

The value in Martin et al. (1974) was derived from a sample restricted to in-state users. Although this tends to understate the value somewhat, because camping is a regionalized activity, to be conservative, their value was not adjusted upward. However, in Ward's (1982) study, the survey was restricted to New Mexico counties near or adjacent to the sites under study. Because this is a much more drastic sample restriction, a 15% upward adjustment was made.

DOWNHILL SKIING

Literature Reviewed

Only one study dealt with the value of downhill skiing. Walsh[2] (1982) utilized the Contingent Valuation Method to derive a value estimation for downhill skiing at the Colorado areas of Vail, Copper Mountain, and Loveland Basin. Willingness to pay additional money in excess of current trip costs was the payment vehicle used. Data were collected in 1980 utilizing an iterative, in-person survey. A value of $24.30 was reported. The study also reported that an average day of skiing at these areas was 5 hours.

Methodological Adjustments

Conversion of Values to a 1982 Base Year

Walsh's (1982) value of $24.30 converts to a 1982 value of $30.13. No other adjustments were necessary for downhill skiing.

COLD WATER FISHING

Literature Reviewed

Three separate studies in Colorado utilized the Contingent Value Method to measure the value of cold water fishing. Walsh, et al. (1980a) utilized an in-person, noniterative, open-ended questionnaire which asked willingness to pay additional trip costs. Data for this study were collected in 1980. The study reports a value of $10.90 per activity day.

[2]*Letter to the White River National Forest.*

In a second Colorado CVM study, by Walsh et al. (1980b), the questionnaire format was an in-person, noniterative, open-ended willingness to pay additional trip costs survey. Data were collected in 1980. A value of $10.53 per activity day was reported.

The Walsh and Olienyk (1981) study differs from the others in that the in-person survey was used in an iterative format. As with the others, the payment vehicle was willingness to pay additional trip costs. Data were collected in 1980. A value of $8.94 was reported for a 4.6-hour day.

King and Walka (1980) used an individual observation TCM in 1980, on the Fort Apache Indian Reservation, Arizona. The study did not adjust for substitutes or travel time. Updated values[3] are $221 per party trip. There were an average of 4.17 anglers per party, resulting in a value of $53 per angler trip. A trip lasts an average of 5.8 days, resulting in a value of $9.30 per angler day.

Individual observation TCM was also used by Martin et al. (1974) to derive a value for cold water fishing in Arizona. Data were collected in 1970. The study adjusted for substitutes and travel time. A value of $50.13 per household trip was reported. The average length per household trip was 1.9 days, resulting in a value of $26.38 per household per day. Average number of people per household trip was 2.6, resulting in a value of $10.15 per activity day.

An Intermountain Region (Utah, Idaho, Western Wyoming, and Nevada) value was derived by Hansen (1977) utilizing CVM. Data were obtained from the 1975 U.S. Fish and Wildlife Service Hunting and Fishing Survey. This mail survey utilized the noniterative, open-ended format. Respondents were asked how much they were willing to spend before they would not engage in cold water fishing. The study reported a value of $9.76 per activity day.

Gordon (1970) estimated the value of Idaho cold water fishing using the zonal TCM. Data were collected in 1968. The study did not adjust for substitutes or travel time. Gordon reported a value of $3.65 per visitor day for cold water fishing on Idaho's high country lakes.

The U.S. Fish and Wildlife (1980) Hunting and Fishing Survey derived a value for trout fishing in Idaho. This personal interview utilized an iterative CVM format. Respondents were asked willingness to pay additional trip costs during the 1980 hunting and fishing season. A value of $12.93 was derived for Idaho trout fishing.

Brown and Plummer (1979) used Hedonic-TCM to derive a value for cold water fishing in Washington and Oregon. Data were collected in 1976. The study did not adjust for substitutes or travel time. Values of $19.00 and $34.00 per visitor day were reported for Western Washington and Oregon, respectively.

A value for cold water fishing in Kentucky was derived by Bianchi (1969) using the zonal TCM. Fishermen were approached during the 1969 fishing season while they were engaged in fishing and given a survey to complete and return by mail. The study adjusted for travel time and substitutes within the state. A 150-mile zonal cut-off was used when deriving the demand curve. The study reported a value of $3.51 per activity day.

[3]*Personal Communication.*

Weithman and Haas (1982) derived a value for cold water fishing in Lake Taneycomo, Missouri, utilizing the zonal TCM. The data were collected in 1979. The study adjusted for travel time but not substitute sites. A value of $15.67 per visitor day was reported.

Kalter and Gosse (1969) derived a value of $9.19 per visitor day for cold water fishing in New York. Data were collected in 1965. The study did not adjust for travel time or substitute sites.

Vaughan and Russell (1982) used the zonal TCM to derive a national value for trout fishing. Data were collected in 1979 using private fee fishing sites. The study adjusted for travel time and substitutes. When deriving the demand curve a 200-mile radius was used as the cutoff. A value of $19.49 per activity day was reported.

The U.S. Fish and Wildlife (1980) Hunting and Fishing Survey derived a national average value for trout fishing. This personal interview utilized an iterative CVM format. Respondents were asked willingness to pay additional trip costs during the 1980 hunting and fishing season. A national average value of $14.50 was reported.

Methodological Adjustments

Conversion of Values to a 1982 Base Year

The values reported for all cold water fishing studies were converted to 1982 values, and are shown in table 4.

Adjustment for Omission of Travel Time

The cold water fishing studies by Gordon (1970), Brown and Plummer (1979), King and Walka (1980), and Kalter and Gosse (1969) did not include travel time in the values reported. Therefore, these values were increased by 30% (table 4).

Adjustment for Individual Observation TCM

No adjustment was made for individual observation TCM, because the probability of participation in cold water fishing does not exhibit a strong inverse relationship to travel costs.

Adjustment for In-state Sample

Cold water fishing is considered to be a regional or multi-state activity in some areas of the U.S.; therefore, an upward adjustment of 15% was made for studies which did not sample nonresidents (table 4).

WARM WATER (FRESH) FISHING

Literature Reviewed

Martin et al. (1974) utilized the individual observation Travel Cost Method to derive the recreational value of warm water fishing in Arizona. Sampling in 1970 was restricted to in-state users only. Adjustments were made for travel time and substitutes. The study derived an average Arizona value of $45.92 per household trip. The average number of days per household trip was 1.6, resulting in a value of $28.70. The average number of people per household trip was 2.3, resulting in a visitor day value of $12.48.

The individual observation TCM was used by Ziemer et al. (1980) for valuation of Georgia warm water fishing. The 1972 data were restricted to in-state sampling. The study adjusted for travel time but not substitute sites. A value of $26.46 per trip was reported. Average trip length was 2 days, resulting in a value of $13.23 per visitor day.

A study by Gibbs (1974) in Florida, used a variation of individual observation TCM. It was unusual because it used cost per day on site as the price variable. Data were collected in 1970. The study did not adjust for travel time or substitutes. Warm water fishing was valued at $21.62 per trip. Average trip length was 2 days, indicating a value of $10.81 per visitor day.

Warm water fishing was valued in south central Louisiana by Bell (1981) using the Hedonic Method. This study adjusted for travel time. Data were obtained in 1975 from the 1975 National Survey of Hunting and Fishing and The Atchafalaya Basin Users Survey. A value of $15.98 per visitor day was reported.

Vaughan and Russell (1982) derived a national value for warm water fishing using the individual observation TCM. Data were collected in 1979. The study adjusted for both travel time and substitutes. A national value of $14.09 was derived for warm water fishing.

Methodological Adjustments

Conversion of Values to a 1982 Base Year

The values reported for all warm water fishing studies were converted to 1982 values, and are shown in table 5.

Adjustment for Omission of Travel Time

Gibb's (1974) Florida TCM study was the only study for which this adjustment is necessary. Adjusting the value of $23.78 upward by 30% results in a value of $31.00.

Adjustment for Individual Observation TCM

A slight downward adjustment of 15% was made for warm water fishing studies utilizing individual observation TCM, because this activity has a slight inverse relationship between the probability of participation and travel cost (table 5).

Adjustment for In-state Sample

Because warm water fishing is a localized activity, the Martin et al. (1974) study value, which is derived

Table 4.—Cold water fishing methodological adjustments

Author Study location Date of data	Reported value/ Activity day	Adjustment to 1982	Adjustment to include travel time	Adjustment for individual observation	Adjustment for in-state only	Adjusted values/ Activity day
Walsh, et al. (1980a) Colorado 1980	10.90	12.41				12.41
Walsh, et al. (1980b) Colorado 1980	10.53	11.99				11.99
Walsh & Olienyk (1981) Colorado 1980	8.94	9.30				9.30
King & Walka (1980) Arizona 1980	9.30	10.59	13.75			13.75
Martin et al. (1974) Arizona 1970	10.15	22.39			25.75	25.75
Hansen (1977) Intermountain Region 1975	9.76	15.69				15.69
Gordon (1970) Idaho 1968	3.65	8.14	11.57			11.57
USFWS (1980) Idaho 1980	12.93	14.72				14.72
Brown & Plummer (1979) Washington 1976	19.00	29.04	37.75			37.75
Brown & Plummer (1979) Oregon 1976	34.00	51.96	67.55			67.55
Bianchi (1969) Kentucky 1969	3.51	8.58				8.58
Weithman & Haas (1982) Missouri 1979	15.67	19.43				19.43
Kalter & Gosse (1969) New York 1965	9.19	24.94	34.42		37.28	37.28
Vaughan & Russell (1982) US 1979	19.49	24.17				24.17
USFWS (1980) US 1980	14.50	16.50				16.50

Table 5.—Warm water (fresh) fishing methodological adjustments

Author Study location Date of data	Reported value/ Activity day	Adjustment to 1982	Adjustment to include travel time	Adjustment for individual observation	Adjustment for in-state only	Adjusted values/ Activity day
Martin et al. (1974) Arizona 1970	12.48	27.54		23.41		23.41
Bell (1981) Louisiana 1975	15.98	25.69				25.69
Ziemer et al. (1980) Georgia 1972	13.23	26.71		22.70		22.70
Gibbs (1974) Florida 1970	10.81	23.78	31.00	26.35		26.35
Vaughan & Russell (1982) U.S. 1979	14.09	17.47		14.85		14.85

from in-state samples, does not need to be adjusted upward by 15%.

SALT WATER FISHING

Literature Reviewed

The only salt water fishing study found was for flounder fishing in Rhode Island. McConnell (1979) measured recreational salt water fishing values using both the Household Production (Hedonic Method) and the individual observation Travel Cost Method. Data were collected in 1978. The study adjusted for travel time but not substitutes. A value of $30.34 and $67.06 per visitor day was found using TCM and HM, respectively. McConnell identified a reason for the higher value associated with the Household Production. The quality variable is complementary to trips; thus, leaving out either of these variables results in a strong downward bias in the results. The Travel Cost Model does not contain a quality variable; as a result, this measure is an underestimate.

Methodological Adjustments

Conversion of Values to a 1982 Base Year

The values for salt water fishing in Rhode Island convert to 1982 values of $40.81 and $90.19 for TCM and HM, respectively.

Adjustment for Individual Observation TCM

Because in the case of salt water fishing, the probability of participation does not have a strong inverse related to travel cost, no adjustment is necessary.

HIKING

Literature Reviewed

Walsh et al. (1980a) found hiking-backpacking values associated with remote undeveloped high mountain reservoirs in Colorado. Using on-site interviews and a noniterative open-ended Contingent Value Method, they found the value as $13.72 per activity day. Walsh and Olienyk (1981) used an on-site iterative Contingent Value Method to estimate the value of hiking and backpacking along the Front Range of Colorado. They found a value of $9.51 for a 4-hour hiking day and $9.36 for a 5.6-hour backpacking day. Rosenthal[4] (1982) using on-site iterative Contingent Value Method, found an average value of $7.55 per RVD.

Martin et al. (1974) estimated the value of general rural outdoor recreation in Arizona. Hiking was listed as the second most frequent activity. Martin et al. (1974) used the individual observation Travel Cost Method. The data came from a household survey of Arizona residents. They adjusted for travel time. The value reported was $66.54 per household trip. There were 3.4 persons per household trip, and each trip lasted an average of 1.4 days. The value per activity day was $13.97.

Brown and Plummer (1979) estimated the value of hiking and backpacking in western Washington. They used a hedonic-TCM, but did not adjust for travel time. The value per recreation day is $9.40. Their data were based on on-site visitor registration.

Kalter and Gosse (1969) estimated an average value of hiking in New York using the zonal TCM . They did not adjust for travel time. Their data were from Bureau of Outdoor Recreation household survey. Their value was $16.00 per day.

[4]*Letter to Dr. Andrew Farkas, U.S. Department of Agriculture, Forest Service, Washington, D.C.*

Methodological Adjustments

Conversion of Values to a 1982 Base Year

The values reported for all hiking and backpacking studies were converted to 1982 values, and are shown in table 6.

Adjustment for Omission of Travel Time

Both the Brown and Plummer (1979) study and Kalter and Gosse (1969) study omitted travel time. As discussed in the introduction, the values reported were increased 30% to correct for this omission (table 6).

Adjustment for Individual Observation TCM

The values in Martin et al. (1974) were adjusted downward slightly to make it consistent with zonal TCM derived values (table 6).

Adjustment for In-state Sample

While the Martin et al. (1974) survey was restricted to Arizona residents, for national forest hiking, this may not result in a substantial underestimation of dollar values. This is because hiking is a more regionalized activity, at least given the national forest resource attractiveness in Arizona. Therefore, to be conservative, this value was not adjusted upward.

MOTORIZED BOATING

Literature Reviewed

Ward (1982) estimated an average value of $11.39 per day for motorized boating at reservoirs in southeastern New Mexico using an individual observation Travel Cost Method. He adjusted for substitutes and travel time. The household survey was restricted to only neighboring counties.

Sutherland (1980) estimated the average value of motorized boating in Oregon and Washington using a zonal TCM. He did not adjust for travel time, however. His average value was $4.24 per day.

Kalter and Gosse (1969) used a zonal TCM to estimate the average value of motorized boating in the State of New York. Their study did not adjust for travel time. They found an average value of $15.14.

Methodological Adjustments

Conversion of Values to a 1982 Base Year

Updating the Ward (1982), Sutherland (1980), and Kalter and Gosse (1969) studies to 1982 yields value of $15.32, $4.83, and $33.40 per activity day, respectively.

Adjustment for Omission of Travel Time

The Sutherland (1980) study omitted travel time; therefore, making a 30% upward correction yields a

Table 6.—Hiking methodological adjustments

Author Study location Date of data	Reported value/ Activity day	Adjustment to 1982	Adjustment to include travel time	Adjustment for individual observation	Adjustment for in-state only	Adjusted values/ Activity day
Walsh et al. (1980a) Colorado 1980	13.72	15.62				15.62
Walsh & Olienyk (1981) Colorado 1980	9.36-9.51	10.67-10.84				10.67-10.84
Rosenthal (1982) Colorado 1981	7.55	8.25				8.25
Martin et al. (1974) Arizona 1970	13.97	30.80		26.00		26.00
Brown & Plummer (1979) Washington 1976	9.40	14.00	18.20			18.20
Kalter & Gosse (1969) New York 1965	16.00	35.20	45.76			45.76

value of $6.28. The Kalter and Gosse (1969) value also was increased 30% yielding a value of $43.42 per activity day.

Adjustment for Individual Observation TCM

As discussed previously, a downward adjustment is necessary to make values derived from individual observation TCM consistent with zonal TCM. Because the probability of participation in motorized boating is likely to be equally affected by travel cost as by ownership of equipment, a slight downward adjustment is necessary. Therefore, Ward's (1982) value was adjusted to $13.00 per activity day.

Adjustment for In-state Sample

Ward's (1982) sample was restricted to just counties adjacent to the reservoirs. More distant counties and acknowledged out-of-state residents (Texas) were omitted from sampling. While motorized boating at reservoirs is somewhat of a regional activity, these more distant observations are still important. Therefore, an adjustment to $14.00 per activity day was made.

MOTORIZED TRAVEL

Literature Reviewed

The only study found for motorized recreation was an outdoor recreation vehicle study done on Forest Service land in Colorado. Walsh and Olienyk (1981) reported a value of $6.45 for a visit lasting 4.2 hours. This study utilized the Contingent Value Method. It was an on-site interview using iterative bidding. The payment vehicle was change in trip costs.

Methodological Adjustments

Conversion of Value to 1982 Base Year

Conversion to 1982 base year increased the reported value to $6.70. No other methodological adjustments are necessary.

NONMOTORIZED BOATING

Literature Reviewed

Walsh et al. (1980b) used a noniterative, open-ended Contingent Value Method to estimate the average value of rafting and kayaking on nine rivers in western Colorado. The value per day was $12.65 for kayaking and $10.94 for rafting. The 206 interviews took place on site.

Keith et al. (1982) found a value of $23.79 per day using the individual observation Travel Cost Method for recreational floating in Arizona. The "put-in" point on this river is on Forest Service land. The data necessary to do the analysis were collected from on-site interviews.

Michaleson (1977) estimated the value of floating the Middle Fork of the Salmon River and several non-wild and scenic rivers in Idaho. The value per day for the Middle Fork of the Salmon River was $76.85 per activity day. The average value for the other rivers was $10.36. Michaleson used the individual observation TCM. His study adjusted for travel time.

Bowes and Loomis (1980) estimated the values of white water rafting, kayaking, and floatboating on the Westwater Canyon portion of the Colorado River in Utah. They used a zonal TCM, but did not adjust for travel time. Their value was $19.00 per activity day. The data came from trip permits.

Sutherland (1980) estimated the value of boating in Oregon and Washington using the zonal TCM. He did not adjust for travel time, however. Sutherland found an average value of $4.24 per day.

Methodological Adjustment

Conversion of Values to a 1982 Base Year

The values reported for all nonmotorized boating studies were converted to 1982 values, and are shown in table 7.

Adjustment for Omission of Travel Time

Because the Sutherland (1980) and Bowes and Loomis (1980) values did not adjust for travel time, they were increased 30% resulting in values of $6.28 and $33.22 per day, respectively.

Adjustment for Individual Observation TCM

The probability of participating in nonmotorized boating may be influenced as much by travel costs as by ownership of specialized equipment and possession of requisite boating skills. Therefore, a small downward adjustment of Michaleson's (1977) and Keith's (1982) individual observation TCM values is necessary to make them comparable to zonal TCM values (table 7).

PICNICKING

Literature Reviewed

The most explicit study of picnicking was done by Walsh and Olienyk (1981) using on-site iterative Contingent Value Method. They found a value of $6.22 per 4.2 hour day. This study was done at several sites along the Front Range in Colorado.

Another Colorado study was of picnicking related recreational use of developed and semi-developed high

Table 7.—Nonmotorized boating methodological adjustments

Author Study location Date of data	Reported value/ Activity day	Adjustment to 1982	Adjustment to include travel time	Adjustment for individual observation	Adjustment for in-state only	Adjusted values/ Activity day
Walsh et al. (1980b) Colorado 1980	10.94–12.65	14.65–16.95				14.65–16.95
Keith et al. (1982) Arizona 1981	23.79	24.79		21.00		
Michaleson (1977) Idaho 1969, 1971	76.85–10.36	176.00–21.85		150.00–18.50		150.00–18.50
Bowes & Loomis (1980) Utah 1978	19.00	25.55	33.22			33.22
Sutherland (1980) Washington-Oregon 1980	4.24	4.83	6.28			6.28

mountain reservoirs (Walsh, et al. 1980a). Using on-site, noniterative, open-ended CVM, they found an average value for these two types of reservoirs of $10.90 per day.

Martin et al. (1974) estimated the value of general rural outdoor recreation in Arizona using the individual observation Travel Cost Method. One of the dominant activities was picnicking. This was a household survey limited to residents only. Martin et al. (1974) found a value of $66.54 per household trip. There were 3.4 people per household trip, resulting in a value per person per trip of $19.57. Since most trips taken primarily for picnicking are 1 day or less in duration, this becomes the value per day. Their study adjusted for travel time and tested for substitutes.

Ward (1982) estimated the value of recreation at several reservoirs in southeastern New Mexico. Because these reservoirs include state parks, some near population centers, picnicking may be one of the most frequent activities. Ward used an individual observation TCM to estimate a value of $11.39 a day. While the sample was restricted only to counties adjacent to each reservoir under study, this limitation is not of too great a concern for a localized activity such as picnicking. This model adjusted for travel time and substitutes.

Knetsch et al. (1976) estimated the value of day trips to California reservoirs using a regional zonal Travel Cost Method. Their model reflected travel time and substitute sites. Again, picnicking reflected a large proportion of the use at these reservoirs. This study estimated an average of $3.33 in 1969.

Methodological Adjustments

Conversion of Values to a 1982 Base Year

The values reported for all picnicking studies were converted to 1982 values, and are shown in table 8.

Adjustment for Omission of Travel Time

None of the TCM studies omitted travel time.

Adjustment for Individual Observation TCM

As discussed previously, a downward adjustment is necessary for studies that used individual rather than zonal TCM when probability of participation is strongly related to travel costs. Picnicking is probably one of those activities. Thus, the Martin et al. (1974) and Ward (1982) values must be adjusted downward by 30% (table 8).

Adjustment for In-state Sample

While the Martin et al (1974) study was restricted to in-state samples, this is not a serious bias for a localized activity such as picnicking. The restriction of Ward's (1982) sample to counties adjacent to the reservoir is more of a concern, but to be conservative, no adjustment was made. However, this factor should be taken into consideration when reconciling the two different study values.

SMALL GAME HUNTING

Literature Reviewed

Martin et al. (1974) utilized the individual observation Travel Cost Method to derive the value of small game hunting in Arizona. Data were collected in 1970, and sampling was restricted to in-state users. Adjustment for substitutes and travel time were made in the study. The study reported a statewide average value of $23.89 per household trip. The average days per household per trip was 1.1, resulting in a value of $21.72 per house-

Table 8.—Picnicking methodological adjustments

Author Study location Date of data	Reported value/ Activity day	Adjustment to 1982	Adjustment to include travel time	Adjustment for individual observation	Adjustment for in-state only	Adjusted values/ Activity day
Walsh & Olienyk (1981) Colorado 1980	6.22	6.53				6.53
Walsh et al. (1980a) Colorado 1980	10.90	12.41				12.41
Martin et al. (1974) Arizona 1970	19.57	42.61		28.54		28.54
Ward (1982) New Mexico 1978	11.39	15.32		10.26		10.26
Knetsch et al. (1976) California 1969	3.33	7.75				7.75

hold. The average number of persons per household trip was 1.5, resulting in a value of $14.48 per visitor day.

Brown and Plummer (1979) utilized the zonal TCM, in combination with the Hedonic Method, to allow for better utilization of available data. Data was obtained from the 1976 Recreation Information Management System (RIM) and the 1976 RARE II analysis. This Idaho study did not adjust for travel time or substitutes. The study reported a value of $21.43 per visitor day.

An Intermountain (Utah, Idaho, Western Wyoming, and Nevada) value was obtained by Hansen (1977) utilizing data from the 1975 U.S. Fish and Wildlife Service Hunting and Fishing Survey. The Hunting and Fishing Survey used a noniterative, open-ended contingent value mail questionnaire. The study reported a regional value of $13.95 per visitor day.

Bell (1981) utilized the Hedonic Method to derive small game hunting values for the south-central portion of Louisiana. Data from the 1975 National Survey of Hunting and Fishing, along with the Atchafalaya Basin Users Survey were analyzed. The study adjusted for substitutes and travel time. A value of $9.79 per visitor day was reported.

Methodological Adjustments

Conversion of Values to a 1982 Base Year

The values reported for all small game hunting studies were converted to 1982 values, and are shown in table 9.

Adjustment for Omission of Travel Time

The Idaho study done by Brown and Plummer (1979) is the only TCM study which did not adjust for travel time. The value of $32.75 was increased by 30% to $42.58.

Adjustment for Individual Observation TCM

The Martin et al. (1974) study was the only study examined which utilized individual observation TCM. Because the probability of participation in small game hunting is inversely related to travel cost, the value was adjusted downward to $23.93.

UPLAND GAME HUNTING

Literature Reviewed

Only one study dealt with valuation of upland game hunting. Hansen (1977) utilized data from the 1975 U.S. Fish and Wildlife Service Hunting and Fishing Survey to derive a region wide average value for all states in the Intermountain Region. The Hunting and Fishing Survey used a noniterative, open-ended, contingent value mail questionnaire. Other than a lower than desirable return rate (30%), the study is acceptable. Only the new willingness to pay values from Hansen's study are reported here. An average dollar value of $23.06 per activity day was derived.

Methodological Adjustments

Conversion of Values to a 1982 Base Year

Hansen's 1975 value of $23.06 converts to a 1982 value of $37.06. No other adjustments were necessary.

WATERFOWL HUNTING

Literature Reviewed

Brown and Hammack (1972) used the Contingent Valuation Method to derive a value for waterfowl hunting

Table 9.—Small game hunting methodological adjustments

Author Study location Date of data	Reported value/ Activity day	Adjustment to 1982	Adjustment to include travel time	Adjustment for individual observation	Adjustment for in-state only	Adjusted values/ Activity day
Martin et al. (1974) Arizona 1970	14.48	31.95		23.93		23.93
Hansen (1977) Intermountain 1975	13.95	22.42				22.42
Brown & Plummer (1979) Idaho 1976	21.43	32.75	42.58			42.58
Bell (1981) Louisiana 1975	9.79	15.74				15.74

in the Pacific Flyway. Their CVM study was a mail, noniterative open-ended questionnaire. Respondents were asked willingness to pay additional costs during the waterfowl season. Data were collected in 1968. A value of $256.00 per hunter was reported. A hunter spent an average of 10.5 days in the field during the season, resulting in a value of $25.00 per activity day.

Using individual observation Travel Cost Method, Martin et al. (1974) derived a value for waterfowl hunting in Arizona. Data were collected in 1970. Substitutes and travel time were adjusted for in the study. A value of $9.87 per household trip was reported. The average days per household per trip was 1.1, resulting in a value of $8.97 per household per day. The average number of people per household trip was 1.4, resulting in a value of $6.41 per visitor day.

An Intermountain Region value was derived by Hansen (1977) using the CVM. Data were obtained from the 1975 U.S. Fish and Wildlife Service Hunting and Fishing Survey. The mail survey was noniterative, open-ended questionnaire. A value of $20.12 per visitor day was reported.

Waterfowl hunting in a marsh area of south-central Louisiana was valued by Bell (1981), using the Hedonic Method. Data from the 1975 National Survey of Hunting and Fishing and the 1975 Atchafalaya Basin Users Survey were analyzed. The study adjusted for substitutes and travel time. A value of $15.41 per visitor day was reported.

Bishop and Heberlein (1980) valued goose hunting in Wisconsin using several methodologies. Each method, however, derived a value for a goose hunting permit. A value of $63.00 represents the average cash payment accepted to give up a goose hunting permit. The format involved checks from $1 to $200 sent to current holders of permits. They could either accept the check and give up the permit or vice versa. A second sample was asked their hypothetical willingness to pay additional money for a permit. The survey format was a closed-ended noniterative mail questionnaire. This resulted in an average net willingness to pay of $21.00 per permit. A third sample was asked questions which allowed implementing the zonal TCM. The TCM results ranged from $7.00 per permit, when no adjustment was made for travel time, to $32.00 per permit when travel time was valued at ½ the wage rate. Data for each method were collected in 1978.

Methodological Adjustment

Conversion of Values to a 1982 Base Year

The values reported for all waterfowl hunting studies were converted to 1982 values, and are shown in table 10.

Adjustment for Individual Observation TCM

Because the probability of participation in waterfowl hunting is not inversely related to travel cost, no adjustment was made for studies which utilized individual observation TCM.

Adjustment for In-state Sample

Waterfowl hunting is considered to be a multi-state activity. As a result, values from studies which were limited to an in-state sample were adjusted upward by 15%. This adjustment is necessary only in the case of the Martin et al. (1974) study (table 10).

WATER SPORTS

Literature Reviewed

Ward (1982) used the individual observation Travel Cost Method to value lake and reservoir water-based

Table 10.—Waterfowl hunting methodological adjustments

Author Study location Date of data	Reported value/ Activity day	Adjustment to 1982	Adjustment to include travel time	Adjustment for individual observation	Adjustment for in-state only	Adjusted values/ Activity day
Martin et al. (1974) Arizona 1970	6.41	14.14			16.26	16.26
Hansen (1977) Intermountain 1975	20.12	32.34				32.34
Brown & Hammack (1972) Pacific Flyway 1968	25.00	61.11				61.11
Bell (1981) Louisiana 1975	15.41	24.77				24.77
Bishop and Heberlein (1980) Wisconsin 1978 cash	63.00	84.73				84.73
Bishop and Heberlein (1980) Wisconsin 1978 CVM	21.00	28.24				28.24
Bishop and Heberlein (1980) Wisconsin 1978 TCM	32.00	41.66				41.66

recreation in southeastern New Mexico. Data were collected in 1978. Substitutes and travel time were adjusted for in the TCM application. An average dollar value of $11.39 per activity day was derived.

Martin et al. (1974) studied general outdoor recreation, which included water sports. They derived a statewide average for Arizona using the individual observation TCM. Substitutes and travel time were adjusted for in the TCM application. A value of $66.54 was found per household per trip. The average number of days per trip was 1.4, and number in household was 3.4 persons. The resulting value was $13.98 per visitor day.

Grubb and Goodwin (1968) used the zonal TCM to derive water sport values in Texas. Data were collected in 1965. Adjustments were made in the study for substitutes; however, no adjustments were made for travel time. An average value of $3.80 per visitor day was found.

In Florida, Gibbs (1974) ran a variant of the individual observation Travel Cost Method for lake and stream recreation. Data were collected in 1970. This TCM study was unusual, because it used cost per day on site as the price variable. The value derived was $21.62 per 2-day trip, resulting in a value of $10.31 per visitor day.

Kalter and Gosse (1969) valued swimming in New York using the zonal TCM. The study did not adjust for substitutes or travel time. An average value of $9.47 per day was derived.

Methodological Adjustment

Conversion of Values to a 1982 Base Year

The values reported for all water sports studies were converted to 1982 values, and are shown in table 11.

Adjustment for Omission of Travel Time

The study values which omitted travel time were adjusted upward by 30% (table 11).

Adjustment for Individual Observation TCM

Water sport studies which derived values using individual observations were adjusted downward, because there is a strong inverse relation between probability of participation and travel cost (table 11).

WILDERNESS

Literature Reviewed

Perhaps the best empirical estimates for wilderness recreation has been done in Colorado. Walsh and

Table 11.—Water sports methodological adjustments

Author Study location Date of data	Reported value/ Activity day	Adjustment to 1982	Adjustment to include travel time	Adjustment for individual observation	Adjustment for in-state only	Adjusted values/ Activity day
Martin et al. (1974) Arizona 1970	13.98	30.84		20.66		20.66
Ward (1982) New Mexico 1978	11.39	15.32		10.26		10.26
Grubb & Goodwin (1968) Texas 1965	3.80	10.31	13.40			13.40
Gibbs (1974) Florida 1970	10.31	23.78	31.00	20.65		20.65
Kalter & Gosse (1969) New York 1965	9.47	20.83	27.00			27.00

Gilliam (1982) applied the Contingent Value Method to estimate benefits of wilderness hiking and backpacking in Indian Peaks Wilderness Area in Colorado. This was an on-site personal interview that used the CVM with an iterative bidding format. They reported values associated with a wide range of different levels of congestion. They presented the mean congestion levels for hiking and backpacking, which were used to locate the appropriate dollar values. These values were $10.31 for hiking per activity day and $18.29 for backpacking per activity day.

Walsh et al. (1981) calculated a statewide average value for wilderness and roadless area recreation using the individual observation Travel Cost Method. This was based on a sample of more than 200 state residents. Travel time, substitutes, tastes-preferences, and income were all accounted for and included in the regression when statistically significant. The study found a value of $14.00 per visitor day.

Loomis (1979, 1980) estimated the hiking and backpacking values associated with two administratively designated primitive areas in southern Utah. Using the zonal TCM, the values were $8.00 per visitor day for Grand Gulch and $15.00 per visitor day for Paria Canyon. An overall average of $11.50. No adjustment was made for travel time, however. Because these were high desert, primitive areas, the justification for using these studies rests on the concept of Recreation Opportunity Spectrum (ROS) zones. That is recreation opportunities that share the same ROS classification provide a similar experience even if the ecosystem is different. Further research in this region is needed.

Smith and Kopp (1978), using 1972 data, estimated that the average recreation value per visit to the Ventana Wilderness in California was $10.04, with individual estimates ranging between $5.28 and $14.80 depending on the assumptions made about the maximum distance for single purpose trips. However, these authors used only one way distance, and did not adjust for travel time. Because it is well established that round trip distance or travel cost is necessary (Dwyer et al. 1977, Walsh 1977), adjustment is necessary even before the omission of travel time can be corrected later. In a footnote to the longer version of this Smith and Kopp (1980) paper, they indicated that to recalculate their consumer surplus figures to adjust to round trip mileage, one can just double the benefit estimates. Doing this results in a value of $20.08 per visit before adjusting for travel time. Putting this on a per visitor day basis, using data provided by the District Ranger, results in a value of $8.03 per RVD in 1972.

Using a zonal TCM, Brown and Plummer (1979) estimated the wilderness recreation value for wilderness areas in Washington and Oregon. The values per day were $40.00 for Glacier Peak, $37.00 for Goat Rocks, $44.00 for Diamond Peak, and $54.00 for Eagle Cap. This results in an overall average of $43.75. However, this study did not adjust for travel time. These values reflect an upper limit truncation made by Brown and Plummer (1979) to insure single purpose trips. The values without this upper limit truncation were $100.00 per day. The data for the zonal TCM reflects both in-state and out-of-state residents.

Methodological Adjustments

Conversion of Values to a 1982 Base Year

The values reported for all wilderness studies were converted to 1982 values, and are shown in table 12.

Table 12.—Wilderness methodological adjustments

Author Study location Date of data	Reported value/ Activity day	Adjustment to 1982	Adjustment to include travel time	Adjustment for individual observation	Adjustment for in-state only	Adjusted values/ Activity day
Walsh & Gilliam (1982) Colorado 1979	10.31-18.29	12.78-22.68				12.78-22.68
Walsh et al. (1981) Colorado 1980	14.00	15.93		18.32		18.32
Loomis (1979-1980) Utah 1979	11.50	14.95	19.45			19.45
Smith and Kopp (1980) California 1972	8.03	15.79	20.50			20.50
Brown & Plummer (1979) Washington, Oregon 1976	43.75	56.87	73.93			73.93

Adjustment for Omission of Travel Time

The study values from Loomis (1979, 1980), Smith and Kopp (1980), and Brown and Plummer (1979) were adjusted to correct for omission of travel time (table 12).

Adjustment for In-state Sample

Only Walsh et al. (1981) limited the survey to an in-state sample. Because wilderness areas in Colorado draw from a multistate area, a 15% upward adjustment was made (table 12).

CONCLUSION

The recreation values estimated using different methods and in different locations are fairly consistent when the methodological assumptions and dates of studies are standardized. The differences in value that exist can be largely explained by differences in resource quality and relative location from user populations. For example, the $20.50 for the Ventana Wilderness (Smith and Kopp 1980), represents a value for a non-alpine, relatively small wilderness area 135 miles from the San Francisco Bay area and more than 250 miles from the Los Angeles area. The Walsh and Gilliam (1982) $12.78-$22.68 value reflects a large alpine wilderness area within 65 miles of Denver, Colo. The $15.93 represents a state average for wilderness and roadless areas in Colorado well within the Walsh and Gilliam (1982) range. There appears to be a reasonable degree of consistency across methods since the Walsh and Gilliam (1982) study of Colorado Wilderness used an iterative bidding game and Walsh et al. (1981) used a Travel Cost Method. The values also seem to reflect site location and quality. Without the necessary methodological adjustments, such conclusions would be difficult to draw.

Cold water fishing represents another example of values, once methodologically adjusted, that are fairly similar for comparable quality and location (see table 4). The wilderness and cold water fishing examples show the importance of standardizing values across studies. Values which appeared inconsistent initially became more comparable once methodological, quality and location adjustments are made. To better allow for scientific comparisons between studies over time and to ease adoption of research results by federal and state resource agencies, greater consistency in reporting results is needed. At a minimum, researchers should explicitly define the unit of recreation output. What is meant by a trip or visit? Length of stay and the number in the party is crucial information if the information is to be utilized by federal agencies. Another issue is travel time. Was travel time valued and at what rate? What assumptions were made about spatial limits, either in sampling or in statistical estimation? By providing this type of information, recreation benefit estimates may become more useful.

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Comparisons of empirical estimates of the value of wildlife, wilderness, and general recreation require that the values are based on comparable methodologies and comparable units of measurements. Adjustments necessary to allow such comparisons are outlined and are applied to an extensive data base of valuation studies.

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Rocky Mountains



Southwest



Great Plains

U.S. Department of Agriculture
Forest Service

Rocky Mountain Forest and Range Experiment Station

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